It occurs just now in an advanced oviparous state, from which the embryos are issuing. The latter are ciliated all round except over the root-cells at the posterior extremity, like the embryo of *Halichondria simulans*; but there is no ring of long cilia round the base. It is also much smaller, measuring 22 by 15-1800ths inch in its greatest diameters, which brings it near to the size of the embryo of *Halisarca lobularis* (Pl. XX. fig. 11); while it is remarkable for having the third form of skeleton-spicule, viz. the acuate spiniferous one, together with the two forms of flesh-spicules, *alone* developed, all of which, as in other embryos, are confined to the posterior end of the body, where the former (that is, the spined acuates) lie grouped parallel to each other, with their heads posteriorly and their points anteriorly directed, not mixed up heterogeneously in the cell-mass throughout the body (see the position in *Halichondria simulans*, Pl. XXII. fig. 28, *e*).

This sponge should come into my fourth division, or Armatæ—that is, where the spicular skeleton-structure is armed with spined acuates (the echinating spicule), as in *Dictyocylindrus* and the like, since the third form of skeleton-spicule above mentioned appears to be the latter.

I must be pardoned for not believing in the existence of the "bidentate" anchorate mentioned and figured by Dr. Bowerbank here and elsewhere, which I believe to be an optical illusion, since I have sought often and never been able to find one. In no instance does an anchorate appear to me to exist without the elements of the *three* arms or teeth at each extremity, whether it be of the equi- or inequianchorate form.

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## LVII.—*Note on the* Planula- *or* Gastrula-*phase of Development in Mollusca.* By E. Ray Lankester, M.A.

Prof. Salensky, of Kasan, in a recent paper in Leuckart and Troschel's 'Archiv für Naturgeschichte,' expresses doubts as to the occurrence of a *Planula-* or *Gastrula*-phase of development in certain Mollusks in which I have asserted its occurrence *. I am anxious to make some reply to Prof. Salensky; and, first of all, I must ask him and others who, rightly enough, are not prepared to accept "bare assertion" to wait until my drawings are published in the 'Philosophical Transactions' for 1875 before speculating as to whether I am right or not. Let me repeat emphatically what is the condition I have observed in the embryos of *Pisidium*, *Tergipes*, *Polycera*, *Limax*, *Lymnæus*, and, I may now add, *Paludina*. The first cleavage of the

* [A translation of Prof. Salensky's paper has been prepared, and will appear in the next number of the 'Annals.'—Ed.]

egg-cell leads to the formation of a mulberry mass (*Morula* of Häckel); at one point the cells forming this mass become invaginated; the cavity of invagination is the primitive alimentary canal, the invaginated cells constitute its walls. The orifice of invagination closes up, and the pedicle formed by that portion of the primitive alimentary cavity which is continuous with the cells of the outer or body-wall, the pedicle of invagination as I term it, becomes the rectum. In the cases above cited, with the exception of *Paludina*, the rectum is thus for a long time blind. In *Paludina*, however, the orifice of invagination does not close up until a very late stage, if at all, and is ciliated. The mouth and œsophagus eat their way into the primitive alimentary sac *subsequently* in all these cases. In a recent paper on *Lymnæus* I have shown that the cells which are invaginated to form the primitive gastric sac of the *Planula* or *Gastrula* undergo very remarkable modifications before the ultimate form of the alimentary canal is developed (see 'Quarterly Journal of Microscopical Science for October 1874).

I do not hold that the formation of a double-walled sac by *invagination* of a primitively single-walled sac is the essential feature which constitutes a *Gastrula* or *Planula*. The endoderm of this developmental stage may take its origin by *delamination*—that is, by direct cell-division from the primitive single series of cells constituting the wall of a hollow *Morula*. We have accordingly to distinguish these two very different modes of origin of the Diploblastic *Planula* or *Gastrula*. Facts must be accumulated to enable us to decide which is the *original mode* of formation of this developmental form, and to understand the steps by which the one process was substituted for the other. The origin of structures by *invagination*, when looked at broadly in a large series of animal forms and in the case of many organs, points to the conclusion that invagination is an *economy of material*—a mode of rapidly filling in the outline of an organ in the embryo, whilst leaving the organ in a hollow condition for subsequent completion. This is seen in the contrasted modes of development (by delamination on the one hand and by invagination on the other) of the nerve-chord in annelids, in osseous fishes, and in higher Vertebrata, also in the cases of the otocysts of Gasteropods and of Cephalopods. At the same time I do not know that at present we have any strong reason for supposing that the delaminate mode of origin of the *Gastrula*-endoderm preceded the invaginate. That the difference between these two modes of origin is not a fundamental one appears from the fact that in closely allied genera we find either the one or the other occurring indifferently. As I have

suggested, the presence of "nutritive-yelk" particles is very probably a disturbing factor in the early stages of recapitulative development; and I hope by the application of this hypothesis that some further results of a definite kind may be attained.

Meanwhile I beg to assure Prof. Salensky and other doubters that the primitive endoderm does arise by invagination in the Mollusks cited by me, as there will, I hope, shortly be evidence to show in the form of careful drawings.

The drawings of Lovén of embryos of *Crenella* and *Cardium*, which *clearly* indicate a diploblastic phase brought about by invagination as I have followed it out in other Mollusks, are not in the least degree elucidated or touched by Prof. Salensky's figures of young *Ostrea* in the paper in the 'Archiv für Naturgeschichte.' There is no question whatever about the mouth: these stages are long antecedent to the formation of mouth or velum. The figures of Lovén to which I refer are those in which the "Richtungsbläschen" is seen escaping from the mass of cells, and in which an orifice is marked as the orifice at which the "Richtungsbläschen" escape. This orifice is, I am persuaded (by analogy with fully worked-out examples in other Mollusks), the orifice of invagination of the *Gastrula*-endoderm, and *not* connected with the "Richtungsbläschen" as Lovén supposed.

Let me, in conclusion, point out that the publication of figures to illustrate such observations as those which now have to be made, on embryological matters, is in this country a terribly lengthy and tedious affair, and that naturalists must have some patience and consideration for one another under the infliction.

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## BIBLIOGRAPHICAL NOTICE.

*Evenings at the Microscope; or Researches among the Minute Organs and Forms of Animal Life.* By Philip Henry Gosse, F.R.S. A new edition. 8vo. London: Society for promoting Christian Knowledge, 1874.

This little book of Mr. Gosse's (a writer whom one is always pleased to meet in the field of natural history) is intended as a guide to those who, possessing a microscope, are desirous of using that instrument as a means of obtaining something more than mere passing amusement. It is founded for the most part upon his own observations, or at least upon observations practically verified by himself, a circumstance which gives it a very different character from that of most of the compilations which aim at popularizing natural history.

The author's plan is a very admirable one. Instead of going out of his way to describe and figure objects whose great interest is their rarity, he sticks almost throughout to those common forms